

PATENT COOPERATION TREATY

From the INTERNATIONAL SEARCHING AUTHORITY

PCT

To:

PIETRUK, Claus Peter
Heinrich-Lilienfein-Weg 5
D-76229 Karlsruhe
GERMANY

Kanzlei PIETRUK

03. Mai 2005

E.F.: 02.06.05 Frist: 02.07.05

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL SEARCH REPORT AND
THE WRITTEN OPINION OF THE INTERNATIONAL
SEARCHING AUTHORITY, OR THE DECLARATION

(PCT Rule 44.1)

Applicant's or agent's file reference

PACT45/PCTE

Date of mailing
(day/month/year)

02/05/2005

FOR FURTHER ACTION

See paragraphs 1 and 4 below

International application No.

PCT/EP2004/006547

International filing date
(day/month/year)

17/06/2004

Applicant

PACT XPP TECHNOLOGIES AG

1. ☒ The applicant is hereby notified that the international search report and the written opinion of the International Searching Authority have been established and are transmitted herewith.

Filing of amendments and statement under Article 19:

The applicant is entitled, if he so wishes, to amend the claims of the International Application (see Rule 46):

When? The time limit for filing such amendments is normally 2 months from the date of transmittal of the International Search Report; however, for more details, see the notes on the accompanying sheet.

Where? Directly to the International Bureau of WIPO, 34 chemin des Colombettes
1211 Geneva 20, Switzerland, Facsimile No.: (41-22) 740.14.35

For more detailed instructions, see the notes on the accompanying sheet.

2. ☐ The applicant is hereby notified that no international search report will be established and that the declaration under Article 17(2)(a) to that effect and the written opinion of the International Searching Authority are transmitted herewith.
3. ☐ With regard to the protest against payment of (an) additional fee(s) under Rule 40.2, the applicant is notified that:

- ☐ the protest together with the decision thereon has been transmitted to the International Bureau together with the applicant's request to forward the texts of both the protest and the decision thereon to the designated Offices.
- ☐ no decision has been made yet on the protest; the applicant will be notified as soon as a decision is made.

4. Reminders

Shortly after the expiration of **18 months** from the priority date, the international application will be published by the International Bureau. If the applicant wishes to avoid or postpone publication, a notice of withdrawal of the international application, or of the priority claim, must reach the International Bureau as provided in Rules 90bis.1 and 90bis.3, respectively, before the completion of the technical preparations for international publication.

The applicant may submit comments on an informal basis on the written opinion of the International Searching Authority to the International Bureau. The International Bureau will send a copy of such comments to all designated Offices unless an international preliminary examination report has been or is to be established. These comments would also be made available to the public but not before the expiration of 30 months from the priority date.

Within **19 months** from the priority date, but only in respect of some designated Offices, a demand for international preliminary examination must be filed if the applicant wishes to postpone the entry into the national phase until **30 months** from the priority date (in some Offices even later); otherwise, the applicant must, within **20 months** from the priority date, perform the prescribed acts for entry into the national phase before those designated Offices.

In respect of other designated Offices, the time limit of **30 months** (or later) will apply even if no demand is filed within 19 months.

See the Annex to Form PCT/IB/301 and, for details about the applicable time limits, Office by Office, see the *PCT Applicant's Guide*, Volume II, National Chapters and the WIPO Internet site.

Name and mailing address of the International Searching Authority



European Patent Office, P.B. 5818 Patentlaan 2
NL-2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Iveta Bujanska

NOTES TO FORM PCT/ISA/220

These Notes are intended to give the basic instructions concerning the filing of amendments under article 19. The Notes are based on the requirements of the Patent Cooperation Treaty, the Regulations and the Administrative Instructions under that Treaty. In case of discrepancy between these Notes and those requirements, the latter are applicable. For more detailed information, see also the *PCT Applicant's Guide*, a publication of WIPO.

In these Notes, "Article", "Rule", and "Section" refer to the provisions of the PCT, the PCT Regulations and the PCT Administrative Instructions, respectively.

INSTRUCTIONS CONCERNING AMENDMENTS UNDER ARTICLE 19

The applicant has, after having received the international search report and the written opinion of the International Searching Authority, one opportunity to amend the claims of the international application. It should however be emphasized that, since all parts of the international application (claims, description and drawings) may be amended during the international preliminary examination procedure, there is usually no need to file amendments of the claims under Article 19 except where, e.g. the applicant wants the latter to be published for the purposes of provisional protection or has another reason for amending the claims before international publication. Furthermore, it should be emphasized that provisional protection is available in some States only (see *PCT Applicant's Guide*, Annexes B1 and B2).

The attention of the applicant is drawn to the fact that amendments to the claims under Article 19 are not allowed where the International Searching Authority has declared, under Article 17(2), that no international search report would be established (see *PCT Applicant's Guide*, Volume I/A, paragraph 296).

What parts of the international application may be amended?

Under Article 19, only the claims may be amended.

During the international phase, the claims may also be amended (or further amended) under Article 34 before the International Preliminary Examining Authority. The description and drawings may only be amended under Article 34 before the International Examining Authority.

Upon entry into the national phase, all parts of the international application may be amended under Article 28 or, where applicable, Article 41.

When?

Within 2 months from the date of transmittal of the international search report or 16 months from the priority date, whichever time limit expires later. It should be noted, however, that the amendments will be considered as having been received on time if they are received by the International Bureau after the expiration of the applicable time limit but before the completion of the technical preparations for international publication (Rule 46.1).

Where not to file the amendments?

The amendments may only be filed with the International Bureau and not with the receiving Office or the International Searching Authority (Rule 46.2).

Where a demand for international preliminary examination has been/is filed, see below.

How?

Either by cancelling one or more entire claims, by adding one or more new claims or by amending the text of one or more of the claims as filed.

A replacement sheet must be submitted for each sheet of the claims which, on account of an amendment or amendments, differs from the sheet originally filed.

All the claims appearing on a replacement sheet must be numbered in Arabic numerals. Where a claim is cancelled, no renumbering of the other claims is required. In all cases where claims are renumbered, they must be renumbered consecutively (Administrative Instructions, Section 205(b)).

The amendments must be made in the language in which the international application is to be published.

What documents must/may accompany the amendments?

Letter (Section 205(b)):

The amendments must be submitted with a letter.

The letter will not be published with the international application and the amended claims. It should not be confused with the "Statement under Article 19(1)" (see below, under "Statement under Article 19(1)").

The letter must be in English or French, at the choice of the applicant. However, if the language of the international application is English, the letter must be in English; if the language of the international application is French, the letter must be in French.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

| | | |
|---|--|--|
| Applicant's or agent's file reference PACT45/PCTE | FOR FURTHER ACTION <small>see Form PCT/ISA/220 as well as, where applicable, item 5 below.</small> | |
| International application No. PCT/EP2004/006547 | International filing date (day/month/year) 17/06/2004 | (Earliest) Priority Date (day/month/year) 17/06/2003 |
| Applicant PACT XPP TECHNOLOGIES AG | | |

This International Search Report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This International Search Report consists of a total of 7 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

a. With regard to the **language**, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.

☐ The international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).

b. ☐ With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, see Box No. I.

2. ☐ **Certain claims were found unsearchable** (See Box II).

3. ☒ **Unity of invention is lacking** (see Box III).

4. With regard to the title,

☒ the text is approved as submitted by the applicant.

☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

☐ the text is approved as submitted by the applicant.

☒ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box No. IV. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. With regard to the drawings,

a. the figure of the **drawings** to be published with the abstract is Figure No. _____

☐ as suggested by the applicant.

☐ as selected by this Authority, because the applicant failed to suggest a figure.

☐ as selected by this Authority, because this figure better characterizes the invention.

b. ☐ none of the figures is to be published with the abstract.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/EP2004/006547

Box No. IV Text of the abstract (Continuation of item 5 of the first sheet)

A device comprising at least one unit with an instruction pipeline processing data in a sequential manner and an array of configurable processing elements, wherein the array is coupled to the instruction pipeline. A method for coupling said unit and said array.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/EP2004/006547

Box II Observations where certain claims were found unsearchable (Continuation of item 2 of first sheet)

This International Search Report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.:
because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the International Application that do not comply with the prescribed requirements to such an extent that no meaningful International Search can be carried out, specifically:
3. ☐ Claims Nos.:
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box III Observations where unity of invention is lacking (Continuation of item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

see additional sheet

1. ☐ As all required additional search fees were timely paid by the applicant, this International Search Report covers all searchable claims.
2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this International Search Report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☒ No required additional search fees were timely paid by the applicant. Consequently, this International Search Report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

1-7

Remark on Protest

- ☐ The additional search fees were accompanied by the applicant's protest.
- ☐ No protest accompanied the payment of additional search fees.

FURTHER INFORMATION CONTINUED FROM PCT/ISA/ 210

This International Searching Authority found multiple (groups of) inventions in this international application, as follows:

1. claims: 1-7

The first invention solves the problem of combining an array for processing data with a sequential processor. The special technical feature of the first invention is the coupling of the array to the instruction pipeline of the sequential processor.

2. claims: 8-9

The second invention solves the problem of enhancing the memory access of an array for processing data. The special technical feature of the second invention is the duplication of input data.

3. claims: 10-11

The third invention solves the problem of multi-tasking and simultaneous multithreading in an array of data processing elements. The special technical feature of the third invention are processing elements which are reconfigurable at runtime and which are affected by a plurality of configurations, wherein the amount of time allowed for one configuration is limited.

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/006547

A. CLASSIFICATION OF SUBJECT MATTER

IPC 7 G06F15/82 G06F9/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ, INSPEC, COMPENDEX

C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | SIEMERS C ET AL: "The >S<puter: a novel microarchitecture model for execution inside superscalar and VLIW processors using reconfigurable hardware" COMPUTER ARCHITECTURE. PROCEEDINGS OF THE AUSTRALASIAN COMPUTER ARCHITECTURE CONFERENCE ACAC, XX, XX, 1998, pages 169-178, XP002126704 | 1,3-5,7 |
| Y | page 1 | 2,6 |
| Y | US 2003/056202 A1 (MAY FRANK ET AL) 20 March 2003 (2003-03-20) pages 2,6 | 2,6 |
| | ----- -/-- | |

☒ Further documents are listed in the continuation of box C.☒ Patent family members are listed in annex.

° Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier document but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.

"&" document member of the same patent family

Date of the actual completion of the international search

20 December 2004

Date of mailing of the international search report

02/05/2005

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel. (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax: (+31-70) 340-3016

Authorized officer

Kamps, S

INTERNATIONAL SEARCH REPORT

International Application No

PCT/EP2004/006547

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

| Category ° | Citation of document, with indication, where appropriate, of the relevant passages | Relevant to claim No. |
|------------|--|-----------------------|
| X | HAUSER J R ET AL: "Garp: a MIPS processor with a reconfigurable coprocessor" FIELD-PROGRAMMABLE CUSTOM COMPUTING MACHINES, 1997. PROCEEDINGS., THE 5TH ANNUAL IEEE SYMPOSIUM ON NAPA VALLEY, CA, USA 16-18 APRIL 1997, LOS ALAMITOS, CA, USA, IEEE COMPUT. SOC, US, 16 April 1997 (1997-04-16), pages 12-21, XP010247463 ISBN: 0-8186-8159-4 page 1 | 7 |
| X | ----- WITTIG R D ET AL: "OneChip: an FPGA processor with reconfigurable logic" FPGAS FOR CUSTOM COMPUTING MACHINES, 1996. PROCEEDINGS. IEEE SYMPOSIUM ON NAPA VALLEY, CA, USA 17-19 APRIL 1996, LOS ALAMITOS, CA, USA, IEEE COMPUT. SOC, US, 17 April 1996 (1996-04-17), pages 126-135, XP010206399 ISBN: 0-8186-7548-9 page 1 | 1 |
| X | ----- KASTRUP B: "Automatic hardware synthesis for a hybrid reconfigurable CPU featuring Philips CPLDs" PROCEEDINGS OF THE PACT WORKSHOP ON RECONFIGURABLE COMPUTING, XX, XX, 1998, pages 5-10, XP002203032 page 1 | 1 |
| X | ----- RAZDAN R ET AL: "A high-performance microarchitecture with hardware-programmable functional units" PROCEEDINGS OF THE ANNUAL INTERNATIONAL SYMPOSIUM ON MICROARCHITECTURE, XX, XX, 30 November 1994 (1994-11-30), pages 172-180, XP002201228 page 1 | 1 |
| X | ----- US 2002/083308 A1 (DE OLIVEIRA KASTRUP PEREIRA BE ET AL) 27 June 2002 (2002-06-27) page 1 | 1 |
| X | ----- US 6 282 627 B1 (WONG DALE ET AL) 28 August 2001 (2001-08-28) page 1 | 1 |
| A | ----- WO 92/01987 A (TEKSTAR SYSTEMS CORP) 6 February 1992 (1992-02-06) page 7, line 34 - page 8, line 2; figure 1 | 2,6 |

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/EP2004/006547

| Patent document cited in search report | | Publication date | Patent family member(s) | Publication date |
|---|----|---------------------|----------------------------|---------------------|
| US 2003056202 | A1 | 20-03-2003 | AU 2060002 A | 22-04-2002 |
| | | | CA 2458199 A1 | 27-02-2003 |
| | | | DE 10227650 A1 | 19-02-2004 |
| | | | WO 0229600 A2 | 11-04-2002 |
| | | | WO 02071248 A2 | 12-09-2002 |
| | | | WO 02071196 A2 | 12-09-2002 |
| | | | WO 02071249 A2 | 12-09-2002 |
| | | | WO 02103532 A2 | 27-12-2002 |
| | | | WO 03017095 A2 | 27-02-2003 |
| | | | EP 1348257 A2 | 01-10-2003 |
| | | | EP 1454258 A2 | 08-09-2004 |
| | | | EP 1386220 A2 | 04-02-2004 |
| | | | EP 1493084 A2 | 05-01-2005 |
| | | | EP 1402382 A2 | 31-03-2004 |
| | | | JP 2004517386 T | 10-06-2004 |
| | | | JP 2004538675 T | 24-12-2004 |
| | | | JP 2004535613 T | 25-11-2004 |
| | | | JP 2004536373 T | 02-12-2004 |
| | | | JP 2004533691 T | 04-11-2004 |
| | | | JP 2005508029 T | 24-03-2005 |
| | | | US 2004128474 A1 | 01-07-2004 |
| | | | US 2004243984 A1 | 02-12-2004 |
| US 2002083308 | A1 | 27-06-2002 | EP 1346280 A1 | 24-09-2003 |
| | | | WO 0250665 A1 | 27-06-2002 |
| | | | JP 2004516728 T | 03-06-2004 |
| US 6282627 | B1 | 28-08-2001 | AU 8177598 A | 19-01-1999 |
| | | | CA 2291789 A1 | 07-01-1999 |
| | | | EP 1015984 A1 | 05-07-2000 |
| | | | JP 2002511173 T | 09-04-2002 |
| WO 9201987 | A | 06-02-1992 | AU 8417591 A | 18-02-1992 |
| | | | WO 9201987 A1 | 06-02-1992 |

From the
INTERNATIONAL SEARCHING AUTHORITY

Kanzlei PIETRUK

To:

Abl.:

PCT

03. Mai 2005

see form PCT/ISA/220:

02.07.05
First:

02.08.05

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY
(PCT Rule 43bis.1)

Date of mailing

(day/month/year) see form PCT/ISA/210 (second sheet)

02/05/2005

Applicant's or agent's file reference
see form PCT/ISA/220

FOR FURTHER ACTION
See paragraph 2 below

International application No.
PCT/EP2004/006547

International filing date (day/month/year)
17.06.2004

Priority date (day/month/year)
17.06.2003

International Patent Classification (IPC) or both national classification and IPC
G06F15/82, G06F9/38

Applicant
PACT XPP TECHNOLOGIES AG

1. This opinion contains indications relating to the following items:

- ☒ Box No. I Basis of the opinion
- ☒ Box No. II Priority
- ☒ Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- ☒ Box No. IV Lack of unity of invention
- ☒ Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- ☐ Box No. VI Certain documents cited
- ☐ Box No. VII Certain defects in the international application
- ☐ Box No. VIII Certain observations on the international application

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will usually be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA"). However, this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of three months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA:



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D-80298 Munich
Tel. +49 89 2399 - 0 Tx: 523656 epmu d
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Authorized Officer

Kamps, S

Telephone No. +49 89 2399-7070



WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITYInternational application No.
PCT/EP2004/006547

IAP20 Rec'd PCT PTO 15 DEC 2005

Box No. I Basis of the opinion

1. With regard to the **language**, this opinion has been established on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
 - ☐ This opinion has been established on the basis of a translation from the original language into the following language , which is the language of a translation furnished for the purposes of international search (under Rules 12.3 and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material:
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material:
 - ☐ in written format
 - ☐ in computer readable form
 - c. time of filing/furnishing:
 - ☐ contained in the international application as filed.
 - ☐ filed together with the international application in computer readable form.
 - ☐ furnished subsequently to this Authority for the purposes of search.
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**International application No.
PCT/EP2004/006547

Box No. II Priority

1. ☒ The following document has not been furnished:☒ copy of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(a)).☐ translation of the earlier application whose priority has been claimed (Rule 43*bis*.1 and 66.7(b)).

Consequently it has not been possible to consider the validity of the priority claim. This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

2. ☐ This opinion has been established as if no priority had been claimed due to the fact that the priority claim has been found invalid (Rules 43*bis*.1 and 64.1). Thus for the purposes of this opinion, the international filing date indicated above is considered to be the relevant date.3. ☐ The International Searching Authority has not been able to consider the validity of the priority claim because a copy of the earlier application whose priority has been claimed was not available to the International Searching Authority at the time that the search was conducted (Rule 17.1). This opinion has nevertheless been established on the assumption that the relevant date is the claimed priority date.

4. Additional observations, if necessary:

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**International application No.
PCT/EP2004/006547**Box No. III Non-establishment of opinion with regard to novelty, inventive step and industrial applicability**

The questions whether the claimed invention appears to be novel, to involve an inventive step (to be non obvious), or to be industrially applicable have not been examined in respect of:

- ☐ the entire international application,
☒ claims Nos. 8-11

because:

- ☐ the said international application, or the said claims Nos. relate to the following subject matter which does not require an international preliminary examination (*specify*):
- ☐ the description, claims or drawings (*indicate particular elements below*) or said claims Nos. are so unclear that no meaningful opinion could be formed (*specify*):
- ☐ the claims, or said claims Nos. are so inadequately supported by the description that no meaningful opinion could be formed.
- ☒ no international search report has been established for the whole application or for said claims Nos. 8-11
- ☐ the nucleotide and/or amino acid sequence listing does not comply with the standard provided for in Annex C of the Administrative Instructions in that:
- | | |
|----------------------------|--|
| the written form | <input type="checkbox"/> has not been furnished |
| | <input type="checkbox"/> does not comply with the standard |
| the computer readable form | <input type="checkbox"/> has not been furnished |
| | <input type="checkbox"/> does not comply with the standard |
- ☐ the tables related to the nucleotide and/or amino acid sequence listing, if in computer readable form only, do not comply with the technical requirements provided for in Annex C-bis of the Administrative Instructions.
- ☐ See separate sheet for further details

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY**International application No.
PCT/EP2004/006547**Box No. IV Lack of unity of invention**

1. ☒ In response to the invitation (Form PCT/ISA/206) to pay additional fees, the applicant has:
- ☐ paid additional fees.
 - ☐ paid additional fees under protest.
 - ☒ not paid additional fees.
2. ☐ This Authority found that the requirement of unity of invention is not complied with and chose not to invite the applicant to pay additional fees.
3. This Authority considers that the requirement of unity of invention in accordance with Rule 13.1, 13.2 and 13.3 is
- ☐ complied with
 - ☒ not complied with for the following reasons:
see separate sheet
4. Consequently, this report has been established in respect of the following parts of the international application:
- ☐ all parts.
 - ☒ the parts relating to claims Nos. 1-7

Box No. V Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

| | | |
|-------------------------------|-------------|-----------|
| Novelty (N) | Yes: Claims | 2,6 |
| | No: Claims | 1,3,4,5,7 |
| Inventive step (IS) | Yes: Claims | |
| | No: Claims | 2,6 |
| Industrial applicability (IA) | Yes: Claims | 1-7 |
| | No: Claims | |

2. Citations and explanations

see separate sheet

10/561135

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

IAP20 Rec'd PCT/PTO 15 DEC 2005
PCT/EP2004/006547

Re Item IV

Lack of unity of invention

1.1 The separate inventions/groups of inventions are:

- Claims 1-7

The first invention solves the problem of combining an array for processing data with a sequential processor. The special technical feature of the first invention is the coupling of the array to the instruction pipeline of the sequential processor.

- Claims 8-9

The second invention solves the problem of enhancing the memory access of an array for processing data. The special technical feature of the second invention is the duplication of input data.

- Claims 10-11

The third invention solves the problem of multi-tasking and simultaneous multithreading in an array of data processing elements. The special technical feature of the third invention are processing elements which are reconfigurable at runtime and which are affected by a plurality of configurations, wherein the amount of time allowed for one configuration is limited.

1.2 They are not so linked as to form a single general inventive concept (Rule 13.1 PCT) for the following reasons:

1.3 The common concept linking together the independent claims 1, 5, 7, 8, 10 and 11 is an array for processing data. This common concept is not novel and not inventive, since arrays for processing data are well known in the art of parallel processors. There is no technical relationship between the special technical features of the inventions, which furthermore solve different technical problems (see above). Consequently, the inventions lack unity according to Rule 13.1 and 13.2 PCT.

Re Item V

**WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING
AUTHORITY (SEPARATE SHEET)**

International application No.

PCT/EP2004/006547

**Reasoned statement with regard to novelty, inventive step or industrial applicability;
citations and explanations supporting such statement**

2 The following documents are referred to in this communication:

- D1: SIEMERS C ET AL: "The >S<puter: a novel microarchitecture model for execution inside superscalar and VLIW processors using reconfigurable hardware" COMPUTER ARCHITECTURE. PROCEEDINGS OF THE AUSTRALASIAN COMPUTER ARCHITECTURE CONFERENCE ACAC, XX, XX, 1998, pages 169-178, XP002126704
- D2: US 2003/056202 A1 (MAY FRANK ET AL) 20 March 2003 (2003-03-20)
- D3: HAUSER J R ET AL: "Garp: a MIPS processor with a reconfigurable coprocessor" FIELD-PROGRAMMABLE CUSTOM COMPUTING MACHINES, 1997. PROCEEDINGS., THE 5TH ANNUAL IEEE SYMPOSIUM ON NAPA VALLEY, CA, USA 16-18 APRIL 1997, LOS ALAMITOS, CA, USA, IEEE COMPUT. SOC, US, 16 April 1997 (1997-04-16), pages 12-21, XP010247463 ISBN: 0-8186-8159-4
- D4: WITTIG R D ET AL: "OneChip: an FPGA processor with reconfigurable logic" FPGAS FOR CUSTOM COMPUTING MACHINES, 1996. PROCEEDINGS. IEEE SYMPOSIUM ON NAPA VALLEY, CA, USA 17-19 APRIL 1996, LOS ALAMITOS, CA, USA, IEEE COMPUT. SOC, US, 17 April 1996 (1996-04-17), pages 126-135, XP010206399 ISBN: 0-8186-7548-9
- D5: KASTRUP B: "Automatic hardware synthesis for a hybrid reconfigurable CPU featuring Philips CPLDs" PROCEEDINGS OF THE PACT WORKSHOP ON RECONFIGURABLE COMPUTING, XX, XX, 1998, pages 5-10, XP002203032
- D6: RAZDAN R ET AL: "A high-performance microarchitecture with hardware-programmable functional units" PROCEEDINGS OF THE ANNUAL INTERNATIONAL SYMPOSIUM ON MICROARCHITECTURE, XX, XX, 30 November 1994 (1994-11-30), pages 172-180, XP002201228
- D7: US 2002/083308 A1 (DE OLIVEIRA KASTRUP PEREIRA BE ET AL) 27 June 2002 (2002-06-27)
- D8: US-B-6 282 6271 (WONG DALE ET AL) 28 August 2001 (2001-08-28)

3 INDEPENDENT CLAIMS 1 AND 5

- 3.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 1 is not new in the sense of Article 33(2) PCT. Document D1 discloses (the references in parenthesis applying to this document, purely optional features in claim 1 have been omitted):

A method of coupling at least

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- one unit processing data in a sequential manner, said unit for data processing comprising an instruction pipeline (**page 2, section 2, ">S<puter" & fig. 1**), and
- an array for processing data comprising a plurality of data processing cells (**page 3-4, section 3, "s-Paradigm-Unit" & fig. 3**),
- wherein the array is coupled to the instruction pipeline (**see fig. 1**).

3.2 It is noted that lack of novelty of the subject-matter of claim 1 may also be demonstrated on the basis of document D4, D5, D6, D7 or D8 (see the relevant passages in the search report).

3.3 The same reasoning applies, mutatis mutandis, to the subject-matter of the corresponding independent apparatus claim 5, which therefore is also considered not new.

4 INDEPENDENT CLAIM 7

4.1 The present application does not meet the criteria of Article 33(1) PCT, because the subject-matter of claim 7 is not new in the sense of Article 33(2) PCT. Document D1 discloses (the references in parenthesis applying to this document, purely optional features in claim 7 have been omitted):

A method of at least one unit processing data in a sequential manner (**page 2, section 2, ">S<puter" & fig. 1**) and an array for processing data comprising a plurality of data processing cells (**page 3-4, section 3, "s-Paradigm-Unit" & fig. 3**), wherein a path allowing for block data transfer is provided from the data cache and the array (**page 3, paragraph 3 and fig. 1**).

4.2 It is noted that lack of novelty of the subject-matter of claim 7 may also be demonstrated on the basis of document D3 (see the relevant passages in the search report).

5 DEPENDENT CLAIMS 2-4, 6

5.1 Dependent claims 2-4 and 6 do not contain any features which, in combination with

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the features of any claim to which they refer, meet the requirements of the PCT in respect of novelty or inventive step (Article 33(2) and (3) PCT). In detail:

- 5.2 The subject-matter of claim 2 differs from the known method disclosed in D1 in that the path between the unit processing data in a sequential manner and the array for processing data comprises a FIFO. The technical effect of this difference is, that said unit and said array can process data asynchronously. The problem to be solved by the present invention may therefore be regarded as how to integrate a functional unit into the instruction pipeline of a unit processing data in a sequential manner, if the processing time of said functional unit is not in synchrony with the timing of said instruction pipeline.

The solution proposed in claim 2 of the present application cannot be considered as involving an inventive step. Although document D1 assumes that all operations performed by the array finish within one clock cycle, it gives a hint to an asynchronous embodiment (**page 7, section 5, paragraph starting with "Some assumptions", "multi-cycle operations with runtime detection"**). The introduction of a FIFO to couple such an asynchronous array to the rest of the instruction pipeline is obvious, since FIFOs are well-known means for coupling asynchronous processes or devices. Moreover document D2 (**paragraph [0031]**) discloses the use of FIFOs instead of CPU registers.

- 5.3 Regarding claim 3, see section 4.

- 5.4 Regarding claim 4, document D1 implicitly discloses the transfer of status and event information.

- 5.5 Regarding claim 6, see section 4 and section 5.2.

Re Item VII

Certain defects in the international application

- 6 The present application does not meet the criteria of Article 5 PCT for the following reasons:

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- 6.1 The application does not, as required by Rule 5.1(b) PCT adhere to the following structure: "Technical Field", "Background Art", "Disclosure of Invention", "Brief Description of Drawings", "Best Mode(s) for Carrying Out the Invention", "Industrial Applicability". The use of such subheadings is strongly recommended in order to provide uniformity in publication and to facilitate access to the information contained in the international application (see also PCT Examination Guidelines II-4.03).
- 6.2 The application does not comply with Rule 5.1(a)(iii) since it includes a lot of details which are not necessary for elucidating the invention (see also PCT Examination Guidelines II-4.06).
- 7 The present application does not meet the criteria of Article 6 PCT for the following reasons:
- 7.1 It is clear from the description (page 203, right column, last paragraph & page 206, left column, first paragraph), that the following feature is essential to the definition of the invention:
- 'the array for processing data "is integrated into the datapath of the" unit processing data in a sequential manner'
- Since independent claims 1, 5 and 7 do not contain this feature it does not meet the requirement following from Article 6 PCT taken in combination with Rule 6.3(b) PCT that any independent claim must contain all the technical features essential to the definition of the invention.
- 7.2 Claims 1, 2, 4, 5 and 7 contain ambiguous expressions: "(conventional)", "e.g.", "such as". The examiner regards expressions of this kind as having no limiting effect on the scope of a claim; that is to say, the feature following any such expression is regarded as entirely optional (see also PCT Examination Guidelines II-5.40).
- 7.3 Claim 7 contains the ambiguous expression "preferably" which the examiner regards as having no limiting effect on the scope of the claim; that is to say, claim 7 does not refer to any other claim. Left unamended, this claim might lead to an objection

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concerning lack of unity of the invention.

- 7.4 Claims 2 and 6 include the relative term "less tight" which leaves the reader in doubt as to the scope of the feature following this term (see also PCT Examination Guidelines II-5.34).
- 7.5 Claims 2, 3 and 6 contain disclaimers "not being transferred", "not strictly synchronous" (see also PCT Examination Guidelines II-5.41).
- 7.6 Method claims 1, 4 and 7 only contain structural features, but no method steps. Hence the category of these claims is not clear (see also PCT Examination Guidelines II-5.12).
- 7.7 Claim 2 contains an incomplete sentence. The sentence starting with the subject "the input and/or output" misses a verb and an object.